# CHAPTER 15
# FUTURE DIRECTIONS IN EMERGENCY MANAGEMENT

## Chapter Summary

This chapter discusses future directions in emergency management. These can be classified as challenges and opportunities at the global, national, and professional levels. Many of the trends identified by Drabek (1991a) and Anderson and Mattingly (1991) continue to dominate emergency management, including increasing exposure to environmental hazards, increased capabilities offered by advanced emergency management information technology, increasing recognition of the need for pre-impact action (hazard mitigation, emergency preparedness, and recovery preparedness) in the face of inertia or outright resistance, and increased professionalization of emergency management. Nonetheless, there are some new issues, including the potential for changes in the nature of environmental hazards and the increased salience of terrorism as a threat to communities throughout the United States.

## Global Challenges

There are many great global challenges facing emergency managers at the opening of the 21st century. Five of these are global climate change, increasing population and population density, increasing resource scarcities, rising income inequality, and increasing risk aversion.

*Global Climate Change*

The emerging consensus among environmental scientists is that climate change is a fact, notwithstanding uncertainties about the rate of change and its global consequences. The 20th Century saw significant increases in global average temperature and sea level, recession in snow cover, and changes in precipitation patterns (Intergovernmental Panel on Climate Change, 2001). Under any reasonable set of assumptions, this process will continue for the next 40 years and result in a global average temperature increase of 1.4-5.8° C (2.7-10.4° F) and a sea level rise of 0.1-0.9m (4-35 in).

These changes would be challenging even if they followed a simple linear trend. For example, small island developing states (e.g., Jamaica) and coastal communities at all levels of economic development are particularly vulnerable to sea level rise. However, climate change does not appear to be linear. Instead, the rate of change seems to be increasing. Accelerating change is a significant problem because it steadily reduces the amount of time natural and human systems have to adapt to new conditions. Moreover, the effects of climate change at the local level are difficult to predict because variation around the average conditions can vary widely (recall from Chapter 12 that there can be substantial dispersion in the distribution of values around a mean) and these local variations can have unforeseen impacts on households, businesses, and government agencies at those locations.

Some of the most important effects of climate change involve increases in the number of extreme events—greater severity of storms and floods on the one hand and greater severity of drought on the other hand (Mileti, 1999). Extremes of precipitation can increase the incidence of flash floods and riverine flooding in susceptible areas, but one of the most serious effects of climate change could be an increase in drought conditions across the plains of Africa, North and South America. Such droughts could cause severe disruption of agriculturally based economies in those areas. Some of the effects of climate change are manifesting themselves in the increase in conflicts across sub-Saharan Africa, which are driven in part by competition for increasingly scarce water resources and a shrinking availability of arable land. Emergency managers around the world will thus be faced with challenges due to a change in the incidence of both rapid onset (floods) and slow onset (drought) disasters.

*Increasing Population and Population Density*

It is well understood that the world population is increasing—as much as 50% in the next 50 years (Organization for Economic Cooperation and Development, 2003). Most of the population increase will occur in developing countries of Asia and Africa where any inability to meet the increasing increased demand for food, water, and energy will produce political instability in the years ahead. In particular, failed nation states that are unable to meet their population's needs have proved to be fertile grounds for recruiting and training terrorists—Afghanistan and Somalia being recent notable examples.

The problem of population growth is magnified by the increasing concentration of population in major cities and also by the increasing scale and interconnectedness of social, economic, and political transactions. The concentration of population creates the potential for *megadisasters* when densely populated areas are struck by natural disasters or are deliberately attacked by terrorists. The cost of a major earthquake in Tokyo could be as much as $1-3 trillion, which would be 25-75% of the country's Gross Domestic Product. In most countries, 5% is a catastrophic loss (Cherveriat, 2000). Closer to home, Hurricane Andrew could have cost $100 billion instead of $20 billion if it had made landfall a few miles farther north, New Orleans could experience thousands of casualties and be submerged for weeks if a Category 5 hurricane fills Lake Ponchartrain, an event that could cost many times more than the cost of Andrew striking Miami directly. Similarly, the earthquake-prone cities of the country have yet to experience "the Big One"—a temblor approaching M = 8.0; such an earthquake could be much more costly than the 57 lives and $25 billion lost in the Northridge earthquake.

The concentration of population and wealth in major cities is being accompanied by increasing interconnectedness among businesses. As noted in Chapter 6, disrupted flows of information, materials, and money can transmit the impacts of disasters throughout the economic system in ways that are not immediately obvious from the geographical scope of impact. Thus, the economic losses from these megadisasters could have impacts far beyond the area of physical destruction. Nonetheless, as also noted in Chapter 6, the immense size of the United States will limit the geographic, social, and economic scope these disasters.

*Increasing Resource Scarcities*

Although it was noted earlier in this section that there will be increasing *variability in rainfall*, resulting in decreased rainfall in some areas and increased rainfall in other areas, there will be increasing *shortages in water supply* throughout the world because of increasing population (Organization for Economic Cooperation and Development, 2003). There is over 12,500 $km^3$ of freshwater available for human use worldwide, of which half is already being used at the present time. At the current rate of increase in consumption, the level of consumption will reach 90% by 2030 but the level of availability will not be uniform across the world and, indeed, two-thirds of the world's population will experience chronic shortages of safe drinking water by that time. Increasing reliance on polluted water will support the propagation of infectious diseases and encourage international political instability and population migration.

Some experts have forecast similar problems in energy and food. Increased consumption of energy is expected to be approximately 350% in developing countries over the next 50 years (Brown, Gardner & Halweil, 1998) and the same countries' total use of cereal grains in 2010 is likely to increase more than 50% over the levels observed in 1990 (DeHaen, Alexandratos & Bruinsma, 1998). Both types of consumption have the potential for significant effects on local resources (e.g., water and land), as well as regional and global climate. Failures to meet the rising needs of their populations has the potential to create increasing environmental vulnerability (as agriculturally unsustainable land is developed and water resources are depleted), together with social, economic, and political instability—including mass migrations following disasters.

*Rising Income Inequality*

At the same time as a changing climate challenges social, economic, and political systems throughout the world, those systems are themselves changing in ways that increase the vulnerability of large numbers of people. Income and wealth are increasingly concentrated in the hands of the wealthiest, a phenomenon that is increasingly apparent between countries as well as within countries. For example, in 1900 the richest five countries had an average Gross Domestic Product (GDP in 1990 dollars) per capita of about $4,000 whereas the poorest five had GDPs about 1% of that value (Organization for Economic Cooperation and Development, 2003). A century later, however, the richest five countries had an average per capita GDP of about $20,000 whereas the poorest five had made little progress. Rich countries control most of the world's economic resources, and poor countries have become increasingly burdened with impossible levels of debt.

*Increasing Risk Aversion*

Some evidence from research on risk perception and communication suggests the residents of developed countries are demanding steady decreases in the risks associated with many technologies (Organization for Economic Cooperation and Development, 2003). Moreover, disaster victims are substantially less willing to patiently await the restoration of normal community life. People angrily demand to have power restored in hours where they might have waited silently for weeks in the past. Unfortunately, this is rarely accompanied by citizens' increased willingness to pay higher taxes to support an enhanced emergency management capability or, in the case or electric power, increased rates to have power lines placed underground where they are safe from wind damage. Thus, emergency managers must be prepared to “make do” with current levels of resources, respond effectively and efficiently during and after disasters, and to plan how to respond patiently to the unrealistic expectations of some community members.

## Global Opportunities

Emergency managers are also faced with exciting opportunities as the 21st Century begins. These include increased scientific understanding of the hazards and societal responses, as well as revolutionary technologies.

### *Increased Scientific Understanding of Hazards and Societal Responses*

In order to manage hazards effectively, policy makers need to know what is actually causing the problems facing them. There is an increasing awareness at all levels of society of the connection between the ecological health of systems and the occurrence of disasters, both natural and technological. The human dimension is no longer an afterthought. Indeed, t

here is increasing recognition that the economy is part of the ecology, not vice versa (Davison, 2001). All economic benefits are based on the ability of the soil, air and water to perform their life-sustaining functions. This ability is currently unevenly distributed around the world, and is deteriorating in most places. Recuperating this ability once lost is very expensive if not impossible with current technologies, and any deterioration in a nation’s ability to feed its population increases the population’s vulnerability to disasters at the same time as funding is less available for disaster assistance. The increased scientific understanding of these principles has created conflict between those who want to use them as a guide to smart growth and those who wish to pursue economic growth at any cost (preferably where the cost is borne by the taxpayers in general or by future generations).

Increasing numbers of individuals and governments are becoming aware that natural disturbances are not necessarily disasters, but can be healthy events that promote wise occupation and use of lands (Abramowitz 2001). For example, seasonal flooding improves the health of rivers and maintains delta lands that are highly fertile habitat for protein-rich stocks of marine life. Naturally occurring wildfires maintain the health of prairie and some forest habitats by eliminating old diseased trees and limiting the amount of fuel (trees, brush, leaves, and grass) available for burning. Excessive flood control measures are producing a steady loss of coastal land in Louisiana; over suppression of small and medium-sized wildland fires has dramatically increased the amount of fuel and, thus, the potential for catastrophic fires. An increased understanding of, and accommodation to, the natural systems we ultimately depend on can improve our patterns of settlement over the long term, as well as promote changes in the patterns of resource use. Many resources have been exploited for short-term economic purposes with little regard to the long-term effects on critical ecological systems. There are encouraging signs that businesses around the world are making adjustments to their product lines and distribution systems to reflect a more responsible economic ethic.

*Revolutionary Technologies*

The "intelligent city of the 21$^{st}$ Century" has the promise of seamless wireless linkages among its households, businesses, and government agencies (Ellis & Waugh, 2001). Already, people have increasing opportunities to perform such diverse transactions as purchasing goods and services and participating in civic governance electronically rather than face-to-face or by letters (Organization for Economic Cooperation and Development, 2003). Information is increasingly stored in databases that can be interconnected and, indeed, communities are adopting enterprise software systems in which all data collected by a jurisdiction is electronically stored, manipulated, and retrieved within a single software system. Such seamless integration promises increased effectiveness and efficiency throughout all aspects of society and, in particular, has the potential to significantly alter the operation of emergency management. However, electronic technologies also are vulnerability to cyberterrorism.

Much of the early emphasis was on the use of *emergency management information technology* to develop decision support systems in the response phase of disasters (Marston, 1986). Another application that has received increasing attention is the use of computers for conducting hazard/vulnerability analyses. Researchers have described how computers can be used to identify areas at risk (Berke, Larsen & Ruch, 1984; Dash, 1997; Griffith, 1986) and to project the damages resulting from a major incident (French, 1986; Haney, 1986; Scawthorne, 1986). In addition, there are many rapidly developing information technologies with the potential for positive effects on emergency management. These other forms of emergency management information technology include remote sensing, global positioning, cellular communication, and increasingly powerful computing hardware and software. Some of these technologies affect all phases of emergency management, whereas others affect only specific phases.

*Hazard/vulnerability analysis.* The need for systematic data on disaster losses has been recognized for over 20 years (Drabek, 1991a) and has recently received attention again (Mileti, 1999). There are limited data on the frequency with which different types of disasters occur, the cost of those disasters, and the cost-effectiveness of emergency management programmatic activities in reducing disaster costs. Such data are vitally important in an era of increasingly tight budgets, when all departments of government are called upon to demonstrate their cost-effectiveness. Events such as major disasters, which might never occur during a senior administrator's or elected official's term of office, have a difficult time competing for attention with less dramatic, but more certain, demands such as subdivision controls, jail expansions, and street repairs. Emergency managers can become more effective in demonstrating the effectiveness of their programs if they can use the available data, together with computer programs such as HAZUS, to estimate the long-term losses from maximum credible disasters in their communities and compare these to the costs of emergency management actions such as hazard mitigation and emergency preparedness.

Fischer (1998) and Mileti (1999) have noted that increasing amounts of data are accessible through the Internet at the Web sites of federal agencies such as the Federal Emergency Management Agency (FEMA), National Oceanographic and Atmospheric Administration (NOAA), and U.S. Geological Survey (USGS). Hwang, Sanderson, and Lindell (2001) recently found that state emergency management agencies also are making hazard analysis information available on their Web sites. However, Lindell, Sanderson, and Hwang (2002) reported that over one-third of the responding local government agencies use few sources of hazard analysis information and that nearly one-third use no hazard analysis information at all. For those who do access hazard analysis information routinely, internet sites account for a significant portion of the information sources local government agencies have about hazards in their community.

There is increasing data available for assessing community hazard and vulnerability, but limits continue. Flood Insurance Rate Maps (FIRMs) are widely available in hardcopy and also on the Internet, so it is much easier for emergency managers to identify areas in the 100-year and 500-year floodplains. One continuing problem is that floodplain boundaries can change as upstream areas are developed so FIRMs need to be updated but the high cost of conducting the necessary hydrological studies slows the process. As noted in Chapter 6, the long term availability SLOSH has made it possible to identify coastal areas that are exposed to storm surge. Similarly, HAZUS has been available for nearly a decade and has been upgraded recently to address wind and flood in addition to its original earthquake component. These data supplement the large scale maps provided on agency web sites such as those noted in Chapter 6. Hazard analysis data for some toxic chemicals became more widely available in the late 1980s as a result of the reporting requirements of SARA Title III and off site consequence analyses were required in the mid 1990s under Section 112(r) of the Clean Air Act Amendments. These led to the development of ALOHA (Federal Emergency Management Agency, no date) and Technical Guidance for Hazards Analysis (US Environmental Protection Agency, 1987). However, the aftermath of the 9/11 terrorist attacks has led to the restriction of such information because of concerns that it could allow terrorists to identify high value targets. Thus, this information has been limited to the staff members of chemical facilities, LEPCs, SERCs, and LEMAs.

Unquestionably the greatest advances in this area have been associated with the increased availability of Geographical Information Systems (GISs) for database management, mapping, and spatial analysis. This technology has many important applications in emergency management but there are virtually no data on the extent to which GIS is being used by local emergency managers. Emergency management programs in some universities strongly encourage their students to take GIS courses, but even those emergency managers who have not acquired GIS skills can work with land use planners in their jurisdictions who do have those skills (Lindell, et al., 2002).

*Hazard mitigation.* The widespread dissemination of GIS capabilities is probably the single most important technological advance in hazard mitigation also. This technology supports hazard mitigation by providing a more effective method of storing and retrieving data about property parcels and infrastructure within each jurisdiction. GIS makes it possible to develop alternative versions of land use plans that can be compared to determine which of them best satisfies a community's goals for economic development, social justice, and environmental sustainability. In addition, storage of information about flood plains, seismic faults, and vulnerable zones for hazmat facilities and transportation routes will allow emergency managers to work with land use planners to identify the appropriate use for each land parcel. Flexible access to many data layers makes it possible to vary the information displayed at different points in public presentations, thus avoiding inundating audiences with overwhelming detail in the initial stages of community meetings. Finally, the ability to make maps available on a jurisdiction's Web site provides greater information access for citizens.

Assessment of structural resistance to hazard impacts remains a problem because such assessments are most easily and accurately conducted during construction by trained building inspectors. Post-construction assessments of wind and seismic resistance are difficult because connections among structural elements are covered by exterior cladding such as brick and plywood panels. Resistance to air infiltration can be assessed accurately, but the process is time consuming and expensive. Consequently, emergency managers must continue to rely on the age of a neighborhood's structures (and, thus, the version of the building code under which they were built) in making judgments about hazard resistance.

*Emergency preparedness.* The primary technological advances in this area are related to computing and the Internet. Plans and procedures have long been stored and updated on computers, but recent years have seen an increased ability for preparing presentation graphics (e.g., PowerPoint) to facilitate training. Similarly, expanding technology in digital photography and digital video, when combined with storage in CD and DVD formats, facilitates the rapid dissemination of training materials at a very modest cost.

Some applications such as GIS and CAMEO/ALOHA contribute to emergency preparedness (and emergency response) as well as to hazard/vulnerability analysis because they provide databases that can be used to store information other than vulnerable zones (which is the hazard/vulnerability analysis application). For example, these databases can be used during training, drills, and exercises to retrieve data about the locations of specific emergency response resources.

There have been numerous developments in evacuation modeling such as CLEAR (Moeller, Urbanik & Desrosiers, 1981) and EMDSS (Lindell, Prater, Perry & Wu, 2002), but none of them has been made readily available for use by anyone other than their developers and specially trained analysts. Typically, evacuation modeling programs have been run using predetermined scenarios to calculate the evacuation time estimates (ETEs) for specific jurisdictions (Lindell, Prater & Wu, 2002). The obvious limitation of this procedure is that the ETEs are of questionable accuracy if the conditions in an actual incident differ from those analyzed beforehand. In many cases, emergency managers have not been informed about the model's assumptions, so they cannot make the appropriate adjustments when the need arises. OREMS (Oak Ridge National Laboratory, 1998), an evacuation model developed at the Oak Ridge National Laboratory, is currently being revised to provide a graphical user interface that will make it easier for local emergency managers to use.

*Emergency response.* There have been major advances in integrated detection, forecast, and warning systems and the future seems bright for continued advances in this area. Anderson and Mattingly (1991) noted improved prediction technology for meteorological (hurricanes and tornadoes) and hydrological (floods and tsunamis) hazards. This trend has continued and has been accompanied by improvements in the prediction of volcanic eruptions but not earthquakes (Sorensen, 2000).

Sensing and recording devices include hazmat detection systems (chemical, biological, and radiological detection systems), satellite and aerial remote sensing, geographical positioning (GPS) systems, portable weather stations, scanners, and digital cameras. Communications devices include digital phones, pagers, fax machines, and personal computers that are connected through systems such as satellite dishes, and local and wide area network connections. Radio continues to be a mainstay of emergency communications, but there is increasing attention to problems of interoperability. Information processing systems include geographic information systems and chemical dispersion modeling programs, evacuation models, and conferencing software.

At the time of Drabek's (1991a) evaluation, only sirens could provide immediate warnings for large areas. Since then, telephone-based community alerting systems have become increasingly prominent. The NOAA *Weather Radio* system has long provided tone-activated notification of emergencies over most of the populated area of the United States (Travis & Riebsame, 1979) and its coverage has been extended over the years. In addition, the old *Emergency Broadcast System* has been replaced by the new *Emergency Alert System* to provide a greater range of capabilities in the digital age. The *Partnership for Public Warning* has served as a central focus for promoting advanced use of cellular telephones and other digital technologies for notifying emergency managers and responders, as well as warning risk area residents.

Emergency managers are using other information technologies such as cellular telephones, teleconferencing, and satellite communications (Tierney 1995). They also are using specific software for hazard analysis such as GIS (Environmental Systems Research Institute 2000), CAMEO (National Safety Council 1995), ALOHA (FEMA no date), and HAZUS (National Institute for Building Sciences 1998). Although it is clear that these technologies will receive increasing utilization, research will be needed to examine the rate at which these other technologies are being adopted and the factors affecting their adoption.

*Disaster recovery*. Many of the technologies that support emergency response also support disaster recovery, especially in the short-term recovery phase. The increasing availability of cellular telephones, GPS devices, and powerful computers (both notebook and pocket sized) facilitates rapid and definitive disaster assessment. This is especially advantageous in retrieving the locations of critical facilities (schools, hospitals, nursing homes), hazardous facilities, infrastructure (bridges and viaducts), and historic buildings from databases. In addition, damage assessors can enter their findings directly into those databases (bypassing paper forms) and use wireless capabilities to transmit each day's disaster assessments back to the EOC.

*Summary of technological advances*. The most directly relevant assessment of EMIT adoption was conducted by Drabek (1991b), who interviewed personnel in the state emergency management agencies in three states, and also in twelve local emergency management agencies within those states. His study dealt with four major topics: 1) factors affecting the adoption and implementation of personal computers, 2) actual use of personal computers in emergency response, 3) computer impacts on the emergency management agencies, and 4) policy issues regarding computer usage. In addressing the first topic, Drabek found that the chief incentives for implementing computers were “increased office efficiency (e.g., word processing capability); networking potential; budget management; resource management; public warning/evacuation applications (e.g., flash flood warnings); automated emergency notification for staff; and decision support systems such as hurricane tracking” (1991b, p.58). He also discovered several barriers slowing the process of installing computers in these agencies—insufficient numbers of trained staff, machine incompatibility, and inadequate availability of information about EMIT.

Regarding actual computer use in emergency response and disaster recovery (e.g., warning, evacuation, situation reports, communication and damage assessment), Drabek (1991b) found that some emergency managers were using computers for each of these tasks. However, they also faced three major difficulties in this area as well: software inadequacies, staff shortages, and database-related problems.

In connection with computer impacts on emergency management agencies, Drabek also noted emergency managers were required to create new positions and new policies, redefine staff member responsibilities, and consider budget stability. He added that the implementation of computers helped strengthen the image of their agencies because of new capabilities, such as the refined appearance of documents and “reinforced centrality of emergency management agencies within the response network” (1991b, p.115). Finally, Drabek (1991b) reported that all of the survey respondents agreed with three policy proposals. These included creating a national information clearinghouse, publishing a newsletter on the use of personal computers in emergency management, and augmenting federal funding for the implementation of computers in emergency management.

In summary, previous research shows that many information technologies are being employed in emergency management, but there is evidence of implementation barriers that impeded widespread use. A major problem is not the limitations of the best available technology but the limited access many jurisdictions have to such technology because of its expense in terms of hardware and software acquisition, as well as training LEMA personnel to operate it.

## National Challenges

There are many challenges that US emergency managers will have to face directly in the coming years. These include increasing urbanization and hazard exposure, interdependencies in infrastructure, continued emphasis on growth, rising costs of disaster recovery, increasing population diversity, terrorist threats, low priority of emergency management, legal liability, and intergovernmental tensions.

### *Increasing Urbanization and Hazard Exposure*

As is the case for the world population as a whole, that of the United States is projected to increase over the next 50 years. However, the United States will experience a disproportionate share of the increased population growth and property development in hazard prone areas (Federal Emergency Management Agency, 1997; Mileti, 1998; Schwab, Topping, Eadie, Deyle & Smith, 1998). Despite this increasing rate of exposure to environmental hazards, the United States has seen no significant increase in the annual loss of life to these events; indeed, casualties have declined for many hazards because of improved detection, forecast, and warning systems (Sorensen, 2000). What has increased—and is increasing exponentially—is property losses (Mileti, 1999). The continuing rise in risk area population suggests the recent trend of disaster losses will continue for the foreseeable future; casualties will continue to decline because of improved emergency preparedness and response but property losses will continue to increase.

The possible exception to these trends might be a decrease in the downward trend for disaster casualties if increased hurricane forecast accuracy is not accompanied by corresponding increases in evacuation network capacity. In this case, the average annual death toll could reach a stable minimum level with an occasionally large number of casualties during a catastrophic event such as a Category 5 hurricane. Similar spikes in casualties could result from an urban earthquake near M 8.0 in a western state (where building codes have stricter seismic provisions) or of lesser magnitude in a central or eastern state (where there are many buildings made of unreinforced masonry or other seismically vulnerable materials and designs).

*Interdependencies in Infrastructure*

Recent years have seen increasing efficiency throughout the national economy. “Just in time” manufacturing has reduced inventories, thereby increasing profits for investors and lower prices for consumers. In some cases, this increased efficiency has even reduced industrial vulnerability to hazards because reduced inventories mean reduced losses when a disaster does strike. In other cases, however, undamaged companies have become more vulnerable to disasters because of the disruption to their supply chains. The reduction of raw material inventories means companies must shut down their operations if their suppliers are damaged. The effect of natural disasters and accidental technological disasters is likely to be relatively small, but deliberate attacks on electronic government, commerce, and especially banking, could be much more damaging.

Increasing economic concentration in products (e.g., airplane size), organizations (i.e., corporation size), and geographic location (e.g., industrial clustering) all increase short-term efficiency by reducing the amount of resources needed to produce each additional unit of goods and services. In many cases, this economic concentration is stimulated by competition that benefits consumers when reduced costs are passed on to them in the form of reduced prices. However, short-term efficiency necessarily eliminates the reserve resources that are often needed to cope with disruptions that can prevent customers from obtaining needed products and services at any price. Thus, increased diversity and redundancy need to be built into sociotechnical systems to assure they can reliably meet their customers' needs.

*Continued Emphasis on Growth*

Public policy in most communities is significantly affected by "growth coalitions" comprising real estate, construction, and other commercial interest groups who are "focused on the expectation that each will directly or indirectly benefit from growth in public subsidies to and private investments in infrastructure, civic capital, construction, and related activities that help to attract people, employers and jobs to a local area" (Buttel, 1997, p. 47). Such interests have often developed hazard-prone land and promptly sold it to others, so they bore none of the long-term consequences of their development decisions. Attempts to defeat the development of hazard prone areas by opposing all growth are generally neither feasible nor necessary. What is needed is *smart growth* directed to less exposed locations or, if that is not possible (e.g., in the case of tornadoes where there is no local variation in hazard exposure), by implementation of hazard resistant building practices. If emergency managers form coalitions with other local government agencies (e.g. land use planning and community development), businesses (especially banks and insurers whose financial viability is threatened by disaster losses), and community groups, they can reduce disaster losses in their communities.

*Rising Costs of Disaster Recovery*

As noted in the previous section, property losses from environmental hazards are increasing exponentially and a significant portion of those losses are paid by federal disaster relief programs. The problem with this approach is that those with property in the most disaster prone areas receive the most disaster relief, but the cost of this program is distributed over all taxpayers in proportion to the taxes they pay. This would be a fair system if those who received the most disaster relief also paid the highest taxes, but there is no evidence this is the case. Thus, property owners in disaster prone areas are being subsidized by the rest of the taxpayers. A politically fairer and economically more efficient system would be to expand the present system of flood insurance to cover all hazards and to charge premiums in proportion to policyholders' loss potential (Kunreuther & Roth, 1998). This solution was recognized over 30 years ago (White & Haas, 1975) and was noted again 15 years ago (Drabek, 1991a), but has made limited progress. During the 1990s, FEMA was able to improve federal flood insurance by promoting the Community Rating System and reducing repetitive losses (purchasing and demolishing houses that were flooded and repaired numerous times). Nonetheless, further progress in flood insurance has been limited, and insurance for earthquakes and hurricanes has become increasingly problematic, so the cost of disaster recovery seems likely to continue to be borne by an increasingly politicized process of presidential disaster declarations.

*Increasing Population Diversity*

Recent years have seen an increase in the cultural and language diversity of the American population. The number of Hispanic immigrants to southern tier states such as Florida, Texas, and California is well known, but there are increasing numbers of Hispanics in northern states as well. In addition, there are many other cultural and linguistic groups that have also immigrated to this country; in some jurisdictions such as Los Angeles County, there are more than 100 major languages or dialects into which emergency management information needs to be translated. In addition, the average age of the American population has been increasing steadily and the percentage of the population greater than 65 years of age is increasing rapidly. Thus, many more risk area residents will have physical or mental limitations. Some of these will be in nursing homes where they can be readily warned and evacuated in emergencies, but others who live independently will require additional assistance when disasters strike (Tierney, et al., 2001.

There also is increasing inequality in household incomes; over the past decade, the incomes of the top 20% of households have increased, whereas those of the bottom 20% of households have decreased. Further, the median income varies across jurisdictions, with some rural counties having income levels substantially below their urban and suburban counterparts. This has negative implications for jurisdictions whose households have incomes below the national average because it suggests a continually eroding tax base and, thus, dwindling budget allocations for emergency management agencies and the public safety departments with which they most frequently interact. This disparity between the richest and poorest jurisdictions will continue to fuel the “digital divide” between those who do and those who do not have enough money and training to adopt emerging electronic technologies. At the household level, income inequality is an important component of social vulnerability that reduces households’ ability to respond adequately to disasters, let alone undertake hazard mitigation programs.

*Terrorist Threats*

Most terrorist threats involve familiar hazard agents such as explosive and flammable materials; toxic chemicals have been used much less frequently and radiological and biological agents have so far remained a potential threat. These threats initiate the familiar agent-generated demands for emergency assessment, expedient hazard mitigation, and population protection. The methods of emergency assessment will differ from those of the more familiar natural hazards because threat detection and emergency classification, hazard and environmental monitoring, population monitoring and assessment, and damage assessment differ by hazard agent. However, the types of hazard agents used by terrorists might not differ from those that can be released accidentally from fixed-site facilities and transportation of hazardous materials. In fact, the attacks on the World Trade Center and the Pentagon (not to mention the attack on Oklahoma City's Murrah Federal Building) should signal the high likelihood that terrorists are most likely to repeat the use of indigenous materials that are already in the country. That is, future attacks might involve hazardous materials facilities (e.g., chemical or nuclear plants) or transportation routes (e.g., trucks or railcars carrying hazardous materials through densely populated areas).

Similarly, methods of expedient hazard mitigation, such as hazard source control and impact mitigation are likely to be the same as for existing technological hazards. Methods of population protection will also continue to involve protective action selection and population warning, protective action implementation, impact zone access control and security, reception and care of victims, search and rescue, emergency medical care and morgues, and hazard exposure control.

However, terrorist threats could pose some significant new challenges. Exotic chemicals such as sarin gas, "dirty bombs" (explosive devices designed to disperse radioactive materials), and biohazards (e.g., exotic diseases such as Ebola virus) exhibit some behaviors that are unfamiliar to local emergency responders (e.g., contagion rather than contamination).These will require new biohazard-specific emergency response procedures, even though the general processes of emergency assessment, expedient hazard mitigation, and population protection remain the same. Similarly, all terrorist threats initiate response-generated demands that are the same as for more familiar natural and technological hazards. These include agency notification and mobilization, internal direction and control, external coordination, public information, administrative and logistic support, and documentation

Consequently, community preparedness for terrorist threats will continue to have the same objectives as other preparedness for hazards. That is, emergency managers must link preparedness for each hazard agent into existing emergency management networks. In addition, they must anticipate potential hazard impacts on risk area population segments and assess their capabilities for self-protection. They also must develop clear lines of authority and mechanisms for inter-organizational coordination. Further, emergency managers must allocate response functions according to agency competence and resources, identify potential sources of extra-community assistance and establish horizontal and vertical mechanisms to coordinate with them. Finally, they must promote emergency resource acquisition at household, organization, community, and supra-community levels.

As is the case for other hazards, household emergency preparedness for terrorist threats will depend upon basic awareness of hazard agents and feasible protective actions, hazard intrusiveness (frequency of thought, discussion, and information receipt), beliefs about hazards (severity, duration, certainty, immediacy), and beliefs about hazard adjustments (efficacy in protecting persons and property, utility for other purposes, cost, safety, time & effort, equipment & skill, cooperation with others). Moreover, organizational and community emergency preparedness for terrorist threats is likely to continue to have a low priority, especially in small, local, private sector organizations without prior disaster experience. Preparedness for terrorist threats is also likely to show substantial variation in the quality of local preparedness networks. Finally, preparedness for terrorist threats is also likely to rely as much on improvisation as on planning to resolve questions of authority and inter-organizational coordination, and will repeat mistakes identified by disaster researchers and experienced emergency managers unless the lessons learned from past experience are integrated into plans, procedures, and training.

Emergency preparedness for terrorist threats raises some important new issues. The presence of an intelligent adversary escalates information security problems that have emerged during response to industrial accidents and environmental extremes. An intelligent adversary could take advantage of predictable population protective responses to inflict even greater casualties in secondary attacks during mass evacuations. Emergency management and public health agencies at local, state and federal levels must establish methods of emergency response coordination. Local emergency response organizations need to be given training, drills, and exercises on biohazard-specific methods of emergency assessment, expedient hazard mitigation, and population protection. Extensive drills and exercises are needed to determine if biohazard contagion could create emergency response challenges even more complex than those of hazardous materials contamination.

*Low Priority of Emergency Management*

For many years, emergency management has had a low priority on the government agenda, but this changed dramatically in the aftermath of the 9/11 terrorist attacks. The history of previous events suggests interest in any hazard agent is highest when it conveys what Slovic (1987) calls signal value—an indication that a previously unnoticed threat warrants attention. Despite the recent attention to terrorism, it is certainly not a new phenomenon. In fact, terrorism was the proximate cause of World War I; the assassination of Austrian Archduke Ferdinand and his wife in Sarajevo in 1914 initiated a succession of military mobilizations and the outbreak of war all over Europe. Moreover, terrorism has been used for decades in Ireland and Great Britain, and has been institutionalized in the relationship between the Israeli state and the Palestinians.

Indeed, terrorism was not even new in the United States. Only six years before the 9/11 attacks, the Murrah Federal Building was destroyed and 168 people killed in Oklahoma City. What was new about 9/11 was the major strike by foreign nationals on US soil, coupled with the fact that the attack was very dramatic and telegenic, as well as very deadly. The political implications of the attack and its aftermath are vast, and will not be fully understood for generations. The challenge to emergency management professionals is to hold onto and apply what we already know, while adapting as necessary to any changes that are truly required. An additional challenge will be to cope with the restrictions on mobility and access to information that have been implemented in the aftermath of the 9/11 attacks.

If history is any guide to the future, it is likely that recent attention to the threat of terrorist attack will wane in coming years. The 1979 nuclear power plant accident at Three Mile Island, the 1985 chemical release in Bhopal India, and other events have attracted media attention and government action in their immediate aftermath. In the long run, however, the media, the public, and government have reverted to an indifferent attitude toward these hazards. Thus, a major question concerns the length of time terrorism will dominate the news and the spending priorities of government. The generally low priority of emergency management could drop even lower in the coming years because of the substantial increase in the national debt and budget restrictions at state and local levels.

*Legal Liability*

Drabek (1991a) noted senior policymakers considered legal liability to be a major policy issue because of the variation from state to state and, in some cases, the ambiguity within a state regarding emergency managers', emergency responders', and volunteers' liability in an emergency response (see also Pine, 1991). Anderson and Mattingly (1991) recommended emergency managers be aware of the areas in which their actions (especially those intended to protect public safety) might conflict with individuals’ rights (especially property rights). They noted advice from a jurisdiction’s legal counsel is always appropriate, but the potential for infringement on individual rights can be reduced by transparency and reasonableness in the decision making process and fair implementation and enforcement of any actions resulting from those decisions. Thus, emergency managers should have reasonable grounds for taking an action (i.e., a threat to public safety), notify those who will be affected (and, for good measure, those who are likely to *think* they will be affected) by the action, provide affected parties with an opportunity to be heard, and take only those actions that have a rational nexus with the problem (i.e., have a reasonable probability of reducing the threat to public safety). Recent legal decisions such as *Lucas v. South Carolina Coastal Council* (112 S.Ct., at 2886, 1992) and *Dolan v. City of Tigard, Oregon* (114 S.Ct., at 2309, 1994) have clarified the need to avoid actions that constitute public “taking” of all or a substantial portion of the economic value of private property (Platt, 1998). The balance between public safety and private property rights has been a contentious issue for many years; split votes by the U.S. Supreme Court indicate the conflict is unlikely to abate and the direction of future change will be difficult to predict. In addition to maintaining an awareness of current case law on this topic, emergency managers must also be vigilant to changes in state law because many states have passed legislation regarding this issue.

*Intergovernmental Tensions*

One area that exemplified the tensions among federal, state, and local governments during the late 1980s was preparedness for nuclear attack (Anderson & Mattingly, 1991; Drabek, 1991a), but that issue disappeared with the collapse of the Soviet Union. Nonetheless, the fact that intergovernmental tensions have continued is testimony to their structural nature. That is, there are fundamental conflicts among levels of government that are inherent in the powers each level possesses within a federal system of government, as well as in the differences in technical expertise (usually greater at higher levels of government) and site-specific data (usually greater at lower levels of government) and in financial resources (usually greater at higher levels of government) and direct responsibility (usually greater at lower levels of government).

*Conflicting Values*

May and Deyle (1998) have pointed to a conflict between the goals of economic development and private property rights, on the one hand, and public safety and welfare, on the other hand. The balance between these two sets of goals is managed by a system of case law (decided by the courts), legislation, and executive orders and regulations. Each of these three branches of government exists at three different levels (federal, state, and local), so it is no wonder that this system of government has produced a “patchwork” of requirements. Indeed, flood hazards are managed by 12 federal agencies, all 50 states, 3,000 conservation districts, and 20,000 local governments in flood-prone areas (Federal Interagency Floodplain Management Task Force, 1992). The federal government alone has more than 50 hazard management laws and executive orders enacted at different times, producing confusing and conflicting requirements.

As May and Deyle (1998) observe, there is very limited control over land use at the federal level and, indeed, at the state or county levels in some states. Moreover, the federal land use provisions that do exist are weakly enforced and, worse yet, federal programs indirectly encourage development of hazardous areas by providing funding for infrastructure (e.g., roads and sewers) development in hazardous areas, subsidized flood insurance; and grants, subsidized loans, and tax writeoffs to disaster victims. The inevitable consequence of this development is increased number of people and property at risk and an increase in the number of major emergencies and disasters confronting emergency managers. In the absence of mutually agreed restrictions, individual communities often find themselves competing with each other to attract economic development by offering more favorable terms to developers who are, understandably, seeking the most profitable financial outcomes for themselves. Thus, there is a clear need for regional solutions in which jurisdictions commit themselves to a common set of development regulations, especially when these can be supported by financial and technical assistance from higher levels of government or by regional organizations that have the technical capacities none of the local jurisdictions could afford to acquire for themselves. Such approaches can avoid minimal compliance with standardized "cookie cutter" programs.

## National Opportunities

*Increased Emphasis on Vulnerability Reduction*

There was a shift in the federal emphasis within emergency management from response and recovery to pre-impact action during the decade of the 1990s. Project Impact, in particular, played a major role in fostering public-private partnerships to identify hazard-prone areas and promote mitigation actions by government, businesses, and households. Unfortunately federal funding for this initiative has been almost entirely eliminated. Nonetheless, many of the local programs continue to exist and some are funded at the local level (Prater, 2001). Chapter 3 outlined a way for local emergency managers to expand their mission by coordinating or incorporating their Local Emergency Management Committees with local hazard mitigation (Burby, 1998) and disaster recovery (Schwab, et al., 1998) committees.

## Professional Challenges

There are two important professional challenges confronting emergency managers in the coming years. These are linkage of emergency management with new professions and linkage of emergency management practitioners and academic disciplines.

*Linkage of Emergency Management with New Professions*

For years, emergency managers have worked with the fire service, law enforcement, and emergency medical services. Even though unanimity is rarely achieved among these groups, frequent contact among them has generally promoted effective interagency performance in emergency preparedness and response. In many communities, Project Impact's emphasis on hazard mitigation stimulated increased involvement of emergency managers with departments of land use planning and community development. Similarly, increased concern about biological threats has increased the interaction of emergency managers with public health departments. Nonetheless, the contacts with these new agencies appear to have remained limited and could revert to their previous low levels in the aftermath of the termination of Project Impact (in the case of departments of land use planning and community development) and if years pass with no biological attacks (public health departments).

*Linkage of Emergency Management Practitioners and Academic Disciplines*

The linkage between emergency management practitioners and hazard/disaster researchers is a topic that has been addressed repeatedly at the annual workshop of the Natural Hazards Research and Applications Center at the University of Colorado, Boulder. The recurrent complaint from each group is that the other fails to meets its needs and does not understand its constraints. This gap between academics and practitioners is not unique to emergency management; it is a complaint voiced in connection with every other professional department in academe. The authors have heard this complaint in connection with the professions of architecture, business, construction, engineering, public administration, public health, and urban and regional planning. There is no easy solution to the gap between academics and practitioners because emergency management professors and practicing emergency managers are employed by institutions with very different cultures and face different situational constraints in their daily work. Emergency managers want solutions that address conditions as they currently exist in their federal, states and local agencies. This often means the emergency managers face problems that change from one day to the next and they want a solution immediately (if not yesterday). By contrast, professors have many duties in addition to the service activities they perform for emergency management agencies. They have courses to teach on a relatively rigid academic schedule that limits their flexibility in meeting emergency management agencies needs. Professors in teaching institutions have a large number of courses and must respond to the needs of a large number of undergraduate students. Professors in research institutions have a smaller number of courses, but are expected to supervise graduates (who require much more time than the same number of undergraduates) and conduct research that is reviewed by editors who are often more interested in contributions to disciplinary theory than to the solution of practical problems.

The most positive aspect of this situation is that it seems to be changing for the better. Professors in emergency management and related fields (e.g., geography, planning, political science, psychology, public administration, sociology) seem to have greater contact with emergency managers than was the case in the past. There are increasing numbers of research projects designed to solve practical problems rather than address purely theoretical issues (although the best research makes both theoretical and practical contributions) and increasing numbers of reports written for practitioners rather than for other academics. The increasing number of emergency management programs seems likely to enhance this trend by producing even more professors who want to try to establish productive relationships with emergency managers at all levels of government.

## Professional Opportunities

There are two important professional challenges confronting emergency managers in the coming years. These are the professionalization of emergency management, involvement in hazard mitigation, involvement in pre-impact disaster recovery planning, expansion of the professional domain, and regional collaboration.

### *Professionalization of Emergency Management*

A profession is an occupation that requires an advanced education and training to perform intellectual skills. According to Blanchard (2004), a profession exists when a group of individuals has established a systematic body of knowledge, a system for disseminating that knowledge, and methods for developing new knowledge. Typically, knowledge transmission is achieved by college degrees in that profession's subject area. In addition, a profession has minimum standards of knowledge and skill, as well as established standards of conduct or ethical principles. A profession has an organization—a professional society—that ensures these functions are performed and promotes public recognition of its existence as an organized group with specialized expertise.

For many years, the ranks of emergency managers have been staffed by public safety officers from police and fire departments, or by retired military personnel. If they had a post-secondary degree, it was rarely related to emergency management. However, recent years have seen an increased availability of graduates holding post-secondary degrees in emergency management, which has been a significant improvement over the conditions acknowledged by

Drabek (1991a). As late as 1995, there were only three emergency management programs, (University of North Texas, Thomas Edison University, and Rochester Institute of Technology) and two certificate programs at the University of Wisconsin and UCLA (Blanchard, 2004). By June of 2004, there were 115 programs listed with the FEMA Higher Education Program. Nineteen of these were Associate degrees and eleven Bachelor degrees requiring as many as ten courses, whereas 50 were certificate programs or minors that generally require half as many courses. In addition, there were 35 graduate (28 Master and seven Ph.D.) programs. These programs are currently found in 39 states, with an additional eight states having programs proposed for initiation in the near future. The obvious advantage of hiring someone with a degree in emergency management is that the person begins with a base of knowledge that can be enriched by on-the-job training (OJT) rather than relying solely on OJT.

Although there information readily available about the number of programs, there is much less information available about other aspects of the emergency management staffing process. According to specialists (e.g., Cascio, 1998), the human resource management process for a given job comprises the labor market, applicant pool, selection process, job demands, job context, education and training, performance evaluation, tangible compensation, intangible rewards, job tenure, and turnover. Unfortunately, there appears to be little or no information available about these aspects of the emergency management staffing process (Lindell, 2003). Specifically, there appears to be little data on where new emergency managers are recruited from; who chooses the successful candidates and what criteria they use; what tasks emergency managers perform; and what knowledge, skills and attitudes they need for those tasks (although, see Thomas and Mileti, 2004, for the findings of a recent workshop on this last issue). There also is little data about what resources emergency managers have in their jurisdictions, where they acquire their job skills, and how their performance is evaluated. Moreover, there is little information about emergency managers' compensation (pay and benefits) and intangible rewards for the job, as well as how long they stay in their jobs, why they leave, and where they go. Such information about emergency managers needs to be collected and analyzed to identify systematic patterns in the profession as well as differences by region, state, and jurisdiction size.

*Involvement in Hazard Mitigation*

The need for local emergency managers to become involved in hazard mitigation has been recognized for many years (Anderson & Mattingly, 1991). As noted earlier Project Impact, though discontinued after a change in federal administration, has generated a legacy of exemplary public/private partnerships to promote hazard mitigation. A major question for the future is whether local emergency managers will seize opportunities to absorb the lessons learned during Project Impact and can apply them without the assistance of federal funding.

*Involvement in Pre-impact Disaster Recovery Planning*

Anderson and Mattingly (1991) noted the recent emergence of a recognition that the policies, plans, and procedures needed to facilitate a rapid disaster recovery must be developed before—not after—disaster strikes. As Chapter 11 indicated, there has been significant progress on this issue. Schwab, et al. (1998) provided a detailed guide on pre-impact recovery planning that showed how to integrate hazard mitigation into the process. Later, Wu and Lindell (2004) reported evidence that pre-impact recovery planning accomplishes both objectives—accelerating housing recovery and achieving hazard mitigation activities at the same time as disaster recovery. Pre-impact recovery planning provides also additional opportunities to work with land use planners and building construction officials.

*Expansion of the Professional Domain*

The challenges of working with other professions and with academic disciplines are matched by unparalleled opportunities. Emergency managers must be ready to respond to a wide variety of hazards confronting their communities. As we have seen in Chapter 5, this responsibility can mean dealing with natural events as rare and dramatic as volcanic eruptions or as common and mundane as heat waves. Similarly, emergency managers' responsibilities for technological events can be as rare and dramatic as nuclear power plant accidents or as common and mundane as multi-vehicle traffic accidents producing mass casualties.

Emergency managers' knowledge and skills in helping their communities prepare for a wide range of unexpected events can make them invaluable consultants to senior administrators in managing a wide range of environmental hazards. Indeed, to the degree that they are successful in promoting hazard mitigation, they will see a steady decrease in the amount of time they spend in emergency response. Thus, their role as *emergency* managers could expand to fill a broader function as *environmental hazard* managers.

*Regional Collaboration*

Regional collaboration is likely to be an important solution for the problems created by many types of hazards. Many local jurisdictions enthusiastically established their own Local Emergency Planning Committees and hazmat response teams, only to find how expensive it is to staff, train, and equip an organization that is capable of responding effectively and safely to even a moderate sized incident. The same problems arise in seeking to cope with large scale incidents involving other hazards such as wildfires. Regional collaboration is simply an extension of the common procedure of establishing Mutual Aid Pacts with neighboring jurisdictions to provide assistance in emergencies (Lindell & Perry, 2001). At the most basic level, mutual aid requires at least a minimal degree of commonality between the organizational structures and equipment of the requesting and assisting jurisdictions. At a more advanced level, regional collaboration allows cooperating jurisdictions to obtain services that neither one alone could afford. Typical candidates for regional organizations will be functions that have high cost and infrequent use. As noted earlier, hazmat response teams are expensive to train and equip but would not be used frequently enough to justify the expense in most jurisdictions. A hazmat response regional team would take longer to assemble and respond, but would be significantly less expensive. In a metropolitan area (where there are many jurisdictions in close proximity), the lower cost would be quite likely to offset the additional mobilization time but this is much less likely to be the case in rural areas where the jurisdictions were farther apart. However, a regional hazard/vulnerability analysis team would not have this type of response time constraint, so it could be equally feasible for metropolitan and rural areas. The difference in these two examples should make it clear that the feasibility of regional approaches could vary significantly in hazard/vulnerability analysis, hazard mitigation, emergency preparedness, emergency response, and disaster recovery.

With regional emergency response, and to a lesser extent disaster recovery, comes the need for standardization because assisting organizations are of no use if they have incompatible organizational structures, training, and equipment. As Chapter 11 indicated, many organizations have enthusiastically endorsed the Incident Command System (ICS) or Incident Management System (IMS) as a standardized structure for managing the emergency response organization. Unfortunately, one of the reasons why everyone likes ICS/IMS is because everyone has a version they have “adapted” to their own local conditions with a “few” modifications. Of course, the more ICS/IMS has been “adapted” to local conditions, the less it is the standardized version of ICS/IMS and, thus the fewer of the promised advantages of ICS/IMS that actually will be realized when joint operations must be conducted.

Another approach to standardization can be seen in the revisions to the Federal Response Plan that are currently being reviewed. These might be successful in promoting a higher level of standardization in the design of emergency response organizations than has yet been achieved. This is not to say that complete standardization is likely to be achieved; only that a higher level might result. The degree of standardization will depend on the compatibility of the new system with the disparate structures of thousands of cities and counties in the (also quite disparate) 50 states. Its success in meeting this objective will depend on the willingness of federal agencies, especially the Department of Homeland Security, to engage in a meaningful dialogue with representatives of a wide range of professional organizations in emergency management, fire protection, law enforcement, public health, emergency medicine, public works, and public administration—to name only a few. In addition, successful adoption of new forms of managing emergency response organizations will depend on the federal government's willingness and ability to mandate the new program or to provide incentives for its adoption and implementation by local government. One powerful incentive the federal government has used previously is to make the availability of emergency planning assistance and disaster recovery assistance funds contingent on local adoption of federal programs. Of course, the success of this approach depends on the ability of the mandating agency to monitor compliance. It is easy to obtain letters from local jurisdictions say they have *adopted* a program but it is another matter entirely to verify they have thoroughly *implemented* the program by modifying their plans, procedures, and training to conform exactly to the program. To verify complete implementation requires onsite audits such as those of the US Nuclear Regulatory Commission conducts at over one hundred nuclear power plants throughout the country. However, it is not feasible for any agency to conduct similarly thorough audits in more than ten thousand state and local jurisdictions. Consequently, national standardization is less likely to occur than regional standardization.

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